Medical Electromagnetic Compatibility (EMC) By Francis Colville

In recent years, the U.S. health care system has come under ever increasing scrutiny regarding the high cost of providing adequate/comprehensive health care. Aware of both the financial and public relations costs associated with business the "old way", the health care industry has decided to utilize the latest emerging technology information systems in an attempt to reduce operating costs and improve patient care.

Along with the new technologies came new problem. This is where electromagnetic interference (EMI) was introduced into the U.S. health care systems. EMI is intra-system, inter-system or multi-system interference where on electronic device degrades or inhibits the proper operation of another electronic device.

One arm of the FCC, the FDA and many medical industry trade associations were floundering to understand these new technologies in an attempt to design better electronic systems. Other branches within these same agencies were busy putting into place exhaustive administrative policies in an attempt to control EMI problems associated with these new systems.

The new electronic technologies that have been introduced into the U.S. health care system can loosely be broken down into four areas: 1) Wireless Medical Telemetry System; 2) Wireless Medical Staff Local Cellular Phone System; 3) Wireless and Cellular Personal Electronic Devices; and 4) Miniature Implantable Medical Devices.

The Wireless Medical Telemetry System or WMTS is a very recent addition to the U.S. health care environment in an attempt to help control problems that arose from the medical industry having to use VHF TV frequencies to operate their telemetry equipment. The WMTS is three radio frequency operating bands that will allow medical telemetry equipment to exist on their own part of the frequency spectrum. Up until now, medical telemetry equipment has always been the "adopted" child of the TV industry and were "tolerated" as long as they didn't interfere with the TV stations. However, the TV stations could and did often interfere with the medical industry. The medical industry had no recourse, until now, but to accept the situation.

The Wireless Medical Staff Local Cellular System is just another name for the hospitals internal phone system. Administrators, doctors, nurses and maintenance staff can all communicate with each other using the in-house telephone system.

Wireless Personal Electronic Devices is the category under which cellular phones, wireless personal data assistants (PDAs), walkie-talkies, etc. are grouped. These devices were never considered as being part of a medical environment and their introduction in the hospitals was the primary reason for the rash of administrative controls (warnings signs) that hospitals started to enforce.

The latest technology is miniature medical implantable devices. These are small electronic systems that are surgically implanted into the patient. There are basically two different types of devices. The first is a regulatory device such as a pacemaker. It is used to help control some medical condition which the patient's own systems are deficient. The second type of implantable device is a radio-frequency device that allows physicians to collect data from a patient using a small computer and transmitter.

In the absence of any guidance from the JCAHO, FCC and FDA regarding improving EMC within hospitals and correcting EMI, USACHPPM had drafted administrative controls that were presented as part of MEDCOM Radiation Protection Program (MEDCOM RPP) regulation 40-xx. MEDCOM has just recently approved the MEDCOM Radiation Protection Program (MEDCOM RPP) regulation 40-42, on March 20, 2002. I believe that the US Army is the first organization to have formally adopted some controls to address how to improve EMC in a medical environment and help manage or eliminate EMI.

Now, the personnel at USACHPPM and MEDCOM as a whole, has to get out to the medical treatment facilities (MTFs) worldwide and let them know we now have a vehicle to help the medical staff to take corrective action regarding EMI, cell phone issues, and problems associated with HDTV, etc. We have to inform them about what the FCC, FDA, JCAHO and trade associations like the Association for the Advancement of Medical Instrumentation (AAMI) are proposing for future guidance, are presently providing as guidance and how MEDCOM guidance can help comply with the fast paced and ever changing regulatory part of the medical industry.

Other initiatives with the radiofrequency program involve developing a training course that would be provided to all medical staff explaining what is EMI, how to identify it and what procedures to follow when EMI is suspected, and who to contact for follow-on investigation.

Another initiative within the radiofrequency program regarding EMI control, involve identifying test equipment needed to support on-site investigations of EMI problem. These problems are highly transient and must be tested on-site. Also, engineering procedures must be identified for use in testing electronic equipment for EMI. The radiofrequency program has personnel who have done extensive EMI testing prior to receiving their present assignment with USACHPPM.

The radiofrequency program also has an extensive RF laboratory with three anechoic chambers that can be used to test electronic equipment and determine whether or not the equipment is functioning properly.

Although, USACHPPM primary concern regarding medical EMI remains within the MEDCOM community, we are actively participating where available in conferences, working groups or seminars regarding medical EMI and EMC. POC : Frank Colville, DSN 584-3353, Commercial (410) 436-3353.